IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: GANDEL, Pierre; PRUDHAM, Daniel; ALZINGRE, Jean-Daniel; FOUCAUT, Antoine

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TITLE: LINEAR ACTUATOR COMPRISING A BRUSHLESS POLYPHASE ELECTRIC MOTOR

Preliminary Amendment: CLAIM AMENDMENTS

1. (Currently amended) Linear actuator comprising:

a brushless multiphase synchronous electric motor ~~(2) including~~ having a stator ~~(3)~~ and a rotor ~~(4), the latter~~ acting on a control organ ~~(O)~~ through a driving means ~~(5) designed capable of~~ for converting, over several revolutions, ~~its~~ rotational movement into a linear displacement, ~~characterized in that~~;

~~it includes~~ a springy and/or magnetic restoring means ~~(21) designed capable of~~ for systematically restoring the control ~~unit (0)~~ organ into a reference position in the event of interruption of the power supply to the motor ~~(2)~~;

~~the motor (2) includes~~ a position-detection device ~~(25; 25A)~~ of the motor contributing, in combination with an electronic control unit, to the control or the adjustment of the position of the rotor ~~(4), hence of~~ and the control organ ~~(O)~~; and

~~and with the driving means (5), designed capable of converting the rotational motion of the rotor (4) into a linear movement, is associated~~ an independent reversible reduction device ~~(43)~~ associated with the driving means.

2. (Currently amended) Linear actuator according to claim 1, ~~characterized in that the~~ wherein said springy and/or magnetic restoring means ~~(21)~~ are ~~in the form~~ comprised of at least one springy and/or magnetic element ~~(22) for controlling the rotation of the rotor (4) designed capable, by an action~~ actionable on ~~the latter~~ said rotor~~, of restoring~~ to restore the control organ ~~(O), starting~~ and startable from any position previously imparted ~~to it~~ by the motor ~~(2)~~, into said reference position.

3. (Currently amended) Linear actuator according ~~to any of the preceding claims, characterized in that the~~ Claim 1, wherein said springy and/or magnetic restoring means ~~(21)~~ are ~~defined by~~ comprised of a springy and/or magnetic element ~~(23) designed capable of acting~~ actable directly on the control organ ~~(O)~~ in order to restore ~~it, starting~~ the control organ and startable from any position imparted ~~to it~~ by the motor ~~(2)~~, into said reference position.

4. (Currently amended) Actuator according to claim 1, ~~characterized in that the~~ wherein said springy and/or magnetic restoring means ~~(21)~~ are ~~defined in the form~~ comprised of a combination of a springy and/or magnetic element ~~(22) for~~ controlling the rotation of the rotor ~~(2)~~ and ~~of~~ a springy and/or magnetic element ~~(231 acting~~ actable directly on the control organ ~~(O), this~~ so as to restore ~~this~~ the control organ ~~(O)~~ into a reference position, ~~starting~~ and being startable from any position previously imparted ~~to it~~ by the motor ~~(2)~~.

5. (Currently amended) Linear actuator according to ~~any of the preceding claims, characterized in that the~~ Claim 1, wherein said driving means ~~(5) designed capable of~~ for converting the rotational motion of the rotor ~~(4)~~ into a linear movement ~~are designed of a~~ is reversible ~~type~~.

6. (Currently amended) Linear actuator according to ~~any of the preceding claims, characterized in that the~~ Claim 1, wherein said driving means ~~(5) designed capable of~~ for converting the rotational movement of the rotor ~~(4)~~ into a linear movement are ~~defined by~~ comprised of a screw and nut system ~~(14)~~, the rotor ~~(4) including~~ having, at the level of an axial bore ~~(15)~~, a nut ~~(16)~~ engaged with a coaxial threaded rod ~~(17; 17A; 17B) designed capable of~~ defining, directly or indirectly, the control organ ~~(O)~~.

7. (Currently amended) Linear actuator according to claim 6, ~~characterized in that the~~ wherein said nut ~~(16)~~ carried by the rotor ~~(4)~~ is mounted moveably on a fixed threaded rod ~~(17B)~~ so as to be ~~capable of moving~~ movable, according a helical motion, under the stator ~~(3)~~ and ~~of transmitting its~~ having a linear displacement thereof transmittable to the control organ ~~(O)~~ immobilized in rotation ~~by adequate means~~.

8. (Currently amended) Linear actuator according to ~~claim 6 or 7, characterized in that~~ Claim 6, wherein the screw and nut system ~~(14)~~ is of the ball screw type with low friction coefficient.

9. (Currently amended) Linear actuator according to ~~any of claims 1 to 5, characterized in that the~~ Claim 1, wherein said driving means ~~(5) designed capable of~~ for converting the rotational

motion of the rotor ~~(4)~~ into a linear displacement ~~adopt the form~~ is comprised of a system ~~(14A)~~ of the type roller ~~(40)~~ and cam ~~(41)~~, the roller ~~(40)~~ associated with the control organ ~~(O)~~ evolving along a circular cam ~~(41)~~ put into rotation, directly or indirectly, by the rotor ~~(4)~~.

10. (Currently amended) Linear actuator according to ~~any of claims 1 to 5, characterized in that the~~ Claim 1, wherein said driving means ~~(5) designed capable of~~ for converting the rotational motion of the rotor ~~(4)~~ into a linear displacement ~~include~~ comprises a first cam ~~(41)~~ and a second cam ~~(41A)~~ with crossed profiles ~~designed capable of being rotated~~ rotatable with a differential speed, in order to impart to a roller ~~(40A)~~, in the form of a pin, an axial sliding ~~capable of~~ causing the translation of the control organ (O).

11. (Currently amended) Linear actuator according to ~~any of the preceding claims, characterized in that the~~ Claim 1, wherein said detection device ~~(25) consists of~~ comprises magneto-sensitive elements, such as Hall sensors ~~(26)~~, integrated into the stator ~~(3)~~ of the motor ~~(3)~~ ~~so as to be capable of detecting the~~ magnetic poles ~~(7)~~ of the rotor ~~(4)~~ being detectable to the elements.

12. (Currently amended) Linear actuator according to claim 11, ~~characterized in that the~~ wherein said detection device ~~(25A) consists of~~ comprises a linear position sensor ~~(27)~~ associated with the control organ ~~(O)~~.

13. (Currently amended) Linear actuator according to ~~any of the preceding claims, characterized in that the~~ Claim 1, wherein said motor ~~(2)~~ comprises a rotor ~~(4)~~ including N pairs of rotor poles ~~(7)~~ radially magnetized in an alternate direction, N being greater or equal to four, while being different from a multiple of three, the stator ~~(3) including~~ comprising P x 9 identical poles ~~(8)~~ spaced apart by 40°/P, said stator poles ~~(8)~~ being grouped consecutively three by three, so as to define a W-shaped circuit, grouping three consecutive stator poles ~~(8)~~ the central stator pole of which carries the coil ~~(9)~~ of the corresponding phase ~~(10)~~, said central stator poles ~~(8)~~ of two W-shaped circuits, each corresponding to a phase, being angularly spaced apart by 120°.